

IMPROVED WEAR RESISTANCE IN
CARBON FIBER FRICTION MATERIALS

ABSTRACT OF THE DISCLOSURE

Carbon fiber brake preforms (20), specifically, annular discs built up
5 of fabric arc segments (21) composed of continuous fibers (25) and staple
fibers (26). Most of the continuous fibers (25) in the fabric segments
(21) are arranged to be located within 60° of radially from the inner
diameter to the outer diameter of the annular disc (20). The fabric arc
segments have substantially all of their continuous fibers oriented in the
10 radial direction and parallel to the segment arc bisector, or the segments
are arranged in alternating layers in which, respectively, half the
continuous fibers are oriented at a +45 degree angle with respect to the
segment arc bisector and half the continuous fibers are oriented at a -45
degree angle with respect thereto. Methods for making preform
15 composites comprise providing needle-punched nonwoven fabric of
unidirectional continuous fibers and staple fibers, making a plurality of
fabric segments, arranging the segments in a multilayered intermediate,
heating the multilayered intermediate to convert the fibers to carbon, and
densifying the carbonized product. In brake discs made as described,
20 fiber pull-out is minimized, reducing mechanical wear. The disclosed
preform fiber architecture reduces wear rates while maintaining brake disc
strength.